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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/603,976	06/25/2003	Jong Goo Jung	30205/39380	3741
4743	7590	05/16/2005	EXAMINER	
MARSHALL, GERSTEIN & BORUN LLP 233 S. WACKER DRIVE, SUITE 6300 SEARS TOWER CHICAGO, IL 60606			SMOOT, STEPHEN W	
			ART UNIT	PAPER NUMBER
			2813	

DATE MAILED: 05/16/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/603,976

Applicant(s)

JUNG ET AL.

Examiner

Stephen W. Smoot

Art Unit

2813

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 31 March 2005 and 04 May 2005.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-4 and 8-22 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-4, 8-22 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 25 June 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

This Office action is in response to applicant's RCE received on 04 May 2005.

### ***Continued Examination Under 37 CFR 1.114***

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's amendment received on 31 March 2005 has been entered.

### ***Claim Objections***

2. Claim 13 is objected to because of the following informality:  
Claim 13 depends on claim 7, which has been cancelled.  
Appropriate correction is required.

***Claim Rejections - 35 USC § 102***

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1-4, 8-14 are rejected under 35 U.S.C. 102(b) as being anticipated by Suzumura et al. (JP 11-80708 A – from applicant's IDS received on 21 September 2004).

Referring to the enclosed English translation, Suzumura et al. disclose a polishing composition that includes water, abrasives and an acid that can be a perchloric acid ( $\text{HClO}_4$ ), chloric acid ( $\text{HClO}_3$ ), or chlorous acid ( $\text{HClO}_2$ ) (see paragraph [0011]). The abrasives can be silicon oxide (including colloidal silica or fumed silica), aluminum oxide, or cerium oxide (see paragraphs [0013] and [0014]). The silicon dioxide can have a 10 nm to 200 nm particle size (see paragraph [0022]) and, in one embodiment, fumed silica with a diameter of 50 nm is disclosed (see paragraph [0041]). The pH of the polishing composition desirably ranges from 4 to 10, which overlaps the applicant's as-claimed range.

These are all of the limitations set forth in claims 1-4, 8 of the applicant's invention.

Art Unit: 2813

Regarding claims 9-10, the amount of acid desirably has a 1 to 1 molar correspondence with a cation additive that has a concentration ranging from 0.001 to 0.15 moles per liter (see paragraphs [0011] and [0027]). The molecular weight of perchloric acid is about 100.5 grams per mole, the molecular weight of chloric acid is about 84.5 grams per mole, and the molecular weight of chlorous acid is about 68.5 grams per mole because the atomic weight of hydrogen is about 1 gram per mole, the atomic weight chlorine is about 35.5 grams per mole, and the atomic weight of oxygen is about 16 grams per mole. Accordingly, for perchloric acid, about 0.1 to 15 grams per liter (which corresponds to 0.01 to 1.5 weight %) can be added in order to maintain the desired 1 to 1 molar correspondence with the cation additive. Likewise, for chlorous acid, about 0.07 to 10 grams per liter (which corresponds to 0.007 to 1.0 weight %) can be added in order to maintain the desired 1 to 1 molar correspondence with the cation additive. Both of these ranges overlap the applicant's ranges as claimed in claims 9-10.

Regarding claims 11-14, the claimed selectivity ratios are properties that are presumed to be inherent to the slurry of Suzumura et al. because Suzumura et al. have the same compositions as claimed in claims 1, 8 and, accordingly, these compositions must have the same properties (see MPEP section 2112.01).

### ***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

Art Unit: 2813

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 15-16, 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Juengling et al. (US 6,060,783) in view of Suzumura et al. (JP 11-80708 A – from applicant's IDS received on 21 September 2004).

Referring to Figs. 2-6 and column 1, line 59 to column 3, line 20, Juengling et al. disclose a prior art method for gate/wordline stacks that include the following features:

- The stacks include polysilicon lines (24a, 24b, 24c) and nitride caps (27a, 27b, 27c);
- The stacks have nitride sidewall spacers (28) and are covered with an interlayer of BPSG (30);
- Contact openings to silicon substrate (10) are formed in the BPSG layer (30) as shown in Fig. 4; and
- The contact openings are filled with doped polysilicon (44, 46, 48) and can be polished back by CMP until the nitride cap (31) is exposed as shown in Fig. 6.

These are limitations set forth in claims 15-16, 19 of the applicant's invention.

However, Juengling et al. lack the limitations set forth in claim 1 of the applicant's invention, which are directed to a CMP slurry composition and are also limitations of claim 15.

Referring to the enclosed English translation, Suzumura et al. disclose a polishing composition that includes water, abrasives and an acid that can be a

Art Unit: 2813

perchloric acid ( $\text{HClO}_4$ ), chloric acid ( $\text{HClO}_3$ ), or chlorous acid ( $\text{HClO}_2$ ) (see paragraph [0011]). The pH of the polishing composition desirably ranges from 4 to 10, which overlaps the applicant's as-claimed range.

Therefore it would have been obvious to a person of ordinary skill in the art at the time the invention was made to combine the teachings of Juengling et al. and Suzumura et al. in order to use the polishing composition of Suzumura et al. for performing the CMP polish back step of Juengling et al. Suzumura et al. recognize several advantages for using their polishing composition, including a high polishing rate and excellent surface homogeneity (see paragraph [0052]).

7. Claims 17, 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Juengling et al. (US 6,060,783) and Suzumura et al. (JP 11-80708 A – from applicant's IDS received on 21 September 2004) as applied to claim 15 above, and further in view of Lin et al. (US 5,877,052).

As shown above, the combination of Juengling et al. and Suzumura et al. has all of the limitations set forth in claim 15 of the applicant's invention. However this combination lacks the further limitation to claim 15 set forth in claim 17 of the applicant's invention, which is to pattern the word line by etching using carbon tetrachloride or chlorine gas. Also, this combination lacks the further limitation to claim 15 set forth in claim 21 of the applicant's invention, which is to use silane or disilane as the polysilicon source gas. Lin et al. teach that chlorine gas can be used for patterning a polysilicon

Art Unit: 2813

gate (see column 4, lines 7-13). They also teach that silane or disilane can be used for depositing polysilicon by CVD (see column 3, lines 53-62).

Therefore it would have been obvious to a person of ordinary skill in the art at the time the invention was made to combine the teachings of Juengling et al., Suzumura et al., and Lin et al. in order to deposit a polysilicon layer using silane or disilane as the source gas and using chlorine gas as an etchant to pattern this polysilicon layer into a gate structure as taught by Lin et al. Lin et al. recognize that silane or disilane can be used as the silicon source gas for depositing polysilicon by LPCVD (see column 3, lines 53-62) and that chlorine gas can subsequently be used to etch the polysilicon into a gate structure by a conventional RIE process (see column 4, lines 7-13).

8. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Juengling et al. (US 6,060,783) and Suzumura et al. (JP 11-80708 A – from applicant's IDS received on 21 September 2004) as applied to claim 15 above, and further in view of Clampitt (US 5,994,232).

As shown above, the combination of Juengling et al. and Suzumura et al. has all of the limitations set forth in claim 15 of the applicant's invention. However this combination lacks the further limitation to claim 15 set forth in claim 18 of the applicant's invention, which is to use TEOS or silane as a source material for forming oxide spacers. Clampitt teaches that wordline spacers can be formed using TEOS (see column 4, lines 47-64).



Therefore it would have been obvious to a person of ordinary skill in the art at the time the invention was made to combine the teachings of Juengling et al., Suzumura et al., and Clampitt in order to form the spacers using TEOS as taught by Clampitt. Clampitt recognizes that TEOS-based spacers are known in the art (see column 4, lines 61-64).

9. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Juengling et al. (US 6,060,783) and Suzumura et al. (JP 11-80708 A – from applicant's IDS received on 21 September 2004) as applied to claim 15 above, and further in view of Jeng et al. (US 6,033,962).

As shown above, the combination of Juengling et al. and Suzumura et al. has all of the limitations set forth in claim 15 of the applicant's invention. However this combination lacks the further limitation to claim 15 set forth in claim 20 of the applicant's invention, which is to form the contact hole using  $C_4F_8$ ,  $C_2F_6$ , or  $C_3F_8$  as an etching gas. Jeng et al. teach the formation of contact openings in BPSG using an etchant that includes  $C_4F_8$ . (see column 4, lines 38-58).

Therefore it would have been obvious to a person of ordinary skill in the art at the time the invention was made to combine the teachings of Juengling et al., Suzumura et al., and Jeng et al. in order to etch BPSG using  $C_4F_8$  as taught by Jeng et al. Jeng et al. recognize that their etchant chemistry is highly selective to BPSG with respect to silicon nitride, which allows for overetching to completely remove BPSG from the contact opening (see column 4, lines 43-48).

10. Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Juengling et al. (US 6,060,783) and Suzumura et al. (JP 11-80708 A – from applicant's IDS received on 21 September 2004) as applied to claim 15 above, and further in view of Curry, II (US 5,142,828).

As shown above, the combination of Juengling et al. and Suzumura et al. has all of the limitations set forth in claim 15 of the applicant's invention. However this combination lacks the further limitation to claim 15 set forth in claim 22 of the applicant's invention, which is to use a hard pad for the CMP step. Curry, II teaches that hard pads may be used for CMP (see column 3, lines 36-66).

Therefore it would have been obvious to a person of ordinary skill in the art at the time the invention was made to combine the teachings of Juengling et al., Suzumura et al., and Curry, II in order to use a hard pad as taught by Curry, II for CMP polishing. Curry, II recognizes that hard pads offer the advantages of faster polishing and a more planar finish (see column 3, lines 46-50).

### ***Response to Arguments***

11. Applicant's arguments with respect to claims 1-4, 8-22 have been considered but are moot in view of the new grounds of rejection.

***Conclusion***

12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Lee et al. (US 6,436,834 B1 and JP 2001-85375 A) teach an aqueous CMP composition that includes abrasive particles and may include an acidic component that can be chloric acid, bromic acid, perchloric acid, or perbromic acid.

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stephen W. Smoot whose telephone number is 571-272-1698. The examiner can normally be reached on M-F (8:00 am to 4:30 pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr. can be reached on 571-272-1702. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

SWS

Stephen W. Smoot  
Patent Examiner  
Art Unit 2813